PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BCT030132	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FR2003/003367	International filing date *(day/month/year)* 13 novembre 2003 (13.11.2003)	Priority date *(day/month/year)* 19 novembre 2002 (19.11.2002)

International Patent Classification (IPC) or national classification and IPC G10H 1/00

Applicant
FRANCE TELECOM.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of _____5_____ sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

   I ☒ Basis of the report

   II ☐ Priority

   III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   IV ☐ Lack of unity of invention

   V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   VI ☐ Certain documents cited

   VII ☐ Certain defects in the international application

   VIII ☐ Certain observations on the international application

Date of submission of the demand 21 mai 2004 (21.05.2004)	Date of completion of this report 30 July 2004 (30.07.2004)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

Form PCT/IPEA/409 (cover sheet) (July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☒ the description:

pages ___1-55___ , as originally filed

pages _____ , filed with the demand

pages _____ , filed with the letter of _____

☒ the claims:

pages ___1-22___ , as originally filed

pages _____ , as amended (together with any statement under Article 19

pages _____ , filed with the demand

pages _____ , filed with the letter of _____

☒ the drawings:

pages ___1/11-11/11___ , as originally filed

pages _____ , filed with the demand

pages _____ , filed with the letter of _____

☐ the sequence listing part of the description:

pages _____ , as originally filed

pages _____ , filed with the demand

pages _____ , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/ or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

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* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

V.	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-22		YES
	Claims			NO
Inventive step (IS)	Claims	1-22		YES
	Claims			NO
Industrial applicability (IA)	Claims	1-22		YES
	Claims			NO

2. Citations and explanations

1. The invention relates to ambisonic sound encoding (spherical harmonics-based sound encoding) and is characterised by a near field compensation method for sounds reproduced in the proximity of the ear, for example by headphones or loud-speakers, and by a device applying said compensation.

2. The documents cited and discussed in the application appear at first sight to be more relevant than the search report citations because the search report does not appear to cite documents which would directly and clearly relate to an ambisonic approach as defined in the application.

a. Consequently, the examination and the determination of the technical problem, as well as of the features that constitute the solution, are based on the prior art in the field of ambisonic encoding, as it is presented in the application.

b. According to the application (page 4, line 30), the conventional ambisonic approach assumes the playback loudspeakers to be remotely located, which is often not the case in reality (portable device loudspeakers, headphones). The invention therefore aims at solving the

prior art problem, which consists in compensating the near field effects due to the proximity of the reproduction transducers, in particular by means of feature b of claim 1.

c. This compensation is obtained according to claims 1 and 21 of the invention, by filtering each of the sound components expressed in a spherical harmonics base, filtering being a function of a distance R between the transducer and the ear.

3. The most relevant search report citation is D1: CHEN J ET AL, XP000457687, but its relevance is not apt to put into question the claimed protection.

a. D1 explains how the result of a large number of transfer function measurements (HRTF $h(\theta, \phi)$) relative each to an incidence expressed by its polar angles (θ, ϕ) upon a KEMAR human head model (comprising microphones in the ear channels) whose centre is the origin O, so as to represent very faithfully these measurements (equation 7) with a low number M of characteristic space functions $\omega_i(\theta, \phi)$ and inherent transfer functions q_i.

During measurement, sound is generated by a loudspeaker located at a first fixed distance $\rho = 75$ cm from the origin O, the loudspeaker covering 2188 points on the thus defined sphere having O as its centre.

b. However, it should be noted that three features of claim 1 do not appear to be suggested by document D1:

(i) the **second distance R** claimed does not appear to play any role in the modelling process according to D1.

(ii) D1 does not teach any **compensation of the near field effect**: it merely teaches how to represent the measurement of thousands of transfer functions by means of a compact modelling process, without any compensation.

(iii) Finally and especially, there is no reason for either the characteristic space functions $\omega_i(\theta, \phi)$ or the inherent transfer functions q_i to form **a spherical harmonics base** (cf. the definition on page 21, equation [A2] of the present description).

According to D1, the only conditions imposed on the inherent transfer functions q_i are that they should form a orthonormal base for the functions of a function space with N dimensions, and that they should correspond to the inherent vectors (cf. equation 5 of D1) of which the near values are maximum values.

This function base thus depends on experimental measured data. It appears highly unlikely that the thus obtained orthonormal base, by whatever means it is obtained, could be considered a spherical harmonics base, and there is practically no chance that the functions of said base could accidentally take the shape defined on page 21, equation A2, of the present application, which is independent from the measurements performed.

c. The other documents are even less relevant and cannot be combined with D1 because they do not teach sound encoding by means of a spherical harmonics base or of polar co-ordinate functions, nor do they teach the correction or compensation of the near field effects.

d. Claim 21 claims an acquisition device which is very similar to that proposed in D1 because it uses an array of transducers arranged on a sphere instead of a loudspeaker moving on the same sphere, which is a practically equivalent measure.

For this reason, it would have been preferable to cite at least D1 in the application.

However, claim 21 is novel and inventive in relation to the search report citations because the above-mentioned differences (i) and (iii) are also included in claim 21. The other claims are novel and inventive because they are dependent on claim 1 or 21.